

## IN THE CLAIMS

1. (Previously Presented) An electron-emitting apparatus comprising:
  - A) a first electrode and a second electrode disposed on a surface of a substrate;
  - B) first voltage source for applying to said second electrode a potential higher than a potential applied to said first electrode;
  - C) an electron-emitting member disposed on said first electrode;
  - D) a third electrode disposed so as to face said substrate, electrons emitted from said electron-emitting member reaching said third electrode; and
  - E) second voltage source for applying to said third electrode a potential higher than each of the potentials applied to said first and second electrodes,wherein a surface of said electron-emitting member is placed between a plane containing a surface of said second electrode and substantially parallel to the surface of said substrate and a plane containing a surface of said third electrode and substantially parallel to the surface of said substrate, and  
wherein when the distance between said second electrode and said first electrode is  $d$ ; the potential difference applied between said second electrode and said first electrode by said first voltage source is  $V_1$ ; the distance between said third electrode and said substrate is  $H$ ; and the potential difference between the potential applied to said third electrode by said second voltage source and the potential applied to said first electrode by said first voltage source is  $V_2$ , then an electric field  $E_1 = V_1/d$  is within the range from 1 to 50 times an electric

field  $E_2 = V_2/H$ .

2. (Previously Presented) An apparatus according to claim 1, wherein a thickness of said first electrode is larger than a thickness of said second electrode.

3. (Original) An apparatus according to claim 1, wherein said electron-emitting member extends from a position on said first electrode to a position on said substrate between said first electrode and said second electrode.

4. (Original) An apparatus according to claim 1, wherein said substrate has a difference in level between said second electrode and said first electrode, and said third electrode is closer to said first electrode than to said second electrode.

5. (Original) An apparatus according to claim 1, wherein said electron-emitting member is made of a material containing carbon as a main ingredient.

6. (Previously Presented) An apparatus according to claim 1, wherein said electron-emitting member comprises carbon fiber.

7. (Previously Presented) An apparatus according to claim 6, wherein said carbon fiber comprises a graphite nanofiber, a carbon nanotube, amorphous carbon, or a

mixture of at least two of these materials.

8. (Previously Presented) An apparatus according to claim 7, wherein said carbon fiber is grown by using a catalytic particle.

9. (Previously Presented) An apparatus according to claim 8, wherein the catalytic particle comprises Pd, Ni, Fe, Co or an alloy of at least two of these metals.

10. (Original) An apparatus according to any one of claims 1 to 9, wherein a plurality of said first electrodes and a plurality of said second electrodes are disposed on the surface of said substrate.

11. (Original) An apparatus according to claim 10, wherein said plurality of first electrodes and said plurality of second electrodes are electrically connected to wiring in matrix form.

12. (Original) An apparatus according to claim 10, wherein a phosphor capable of emitting light when irradiated with electrons emitted from said electron-emitting member is provided on said third electrode.

13. (Original) An image display apparatus using an electron-emitting

apparatus according to claim 12.

14. (Previously Presented) An electron-emitting device comprising:

A) a cathode electrode and a gate electrode arranged at an interval on a surface of a first substrate; and

B) a plurality of carbon fibers, arranged on said cathode electrode and connected electrically to said cathode electrode,

wherein each of said carbon fibers has a plurality of graphenes which are layered so as not to be parallel to an axis direction of said fiber.

15. (Original) An electron-emitting device according to claim 14, wherein

the plurality of graphenes are substantially parallel to each other.

16-18. (Cancelled)

19. (Previously Presented) A light-emitting apparatus comprising an

electron-emitting device according to any one of claims 14 or 15, and a light-emitting member.

20. (Previously Presented) An image display apparatus comprising a

plurality of electron-emitting devices and a light emitting member capable of emitting light when irradiated with electrons emitting from some of said plurality of electron-emitting devices,

wherein each of said plurality of electron-emitting devices is an electron-emitting device according to claim 14 or 15.

21. (Previously Presented) An electron-emitting apparatus comprising:

A) a first electrode and a second electrode disposed on a surface of a substrate;

B) first voltage source for applying to said second electrode a potential higher than a potential applied to said first electrode;

C) a plurality of carbon fibers disposed on said first electrode; and

D) a third electrode disposed so as to face said substrate, electrons emitted from said carbon fibers reaching said third electrode; and

E) second voltage source for applying to said third electrode a potential higher than each of the potentials applied to said first and second electrodes,

wherein a surface region of said carbon fibers is placed between a plane, which contains a surface of said second electrode and is substantially parallel to the surface of said substrate, and a plane, which contains a surface of said third electrode and is substantially parallel to the surface of said substrate.

22. (Original) An electron-emitting apparatus according to claim 21,

wherein when the distance between said second electrode and said first electrode is  $d$ ; the potential difference applied between said second electrode and said first electrode by said first

voltage source is  $V_1$ ; the distance between said third electrode and said substrate is  $H$ ; and the potential difference between the potential applied to said third electrode by said second voltage source and the potential applied to said first electrode is  $V_2$ , then an electric field  $E_1 = V_1/d$  is within the range from 1 to 50 times an electric field  $E_2 = V_2/H$ .

23. (Previously Presented) An apparatus according to claim 21, wherein each of said carbon fibers is a carbon nanotube.

24. (Previously Presented) An apparatus according to claim 21, wherein each of said carbon fibers comprises a plurality of graphenes stacked so as to be nonparallel to an axis direction of said carbon fiber.

25. (Previously Presented) An apparatus according to claim 21, wherein a material more effective in accelerating deposition of carbon than a material of said first electrode is provided between said carbon fibers and said first electrode.

26. (Original) An apparatus according to claim 25, wherein said material effective in accelerating deposition of carbon comprises Pd, Ni, Fe, Co or an alloy formed of at least two of said metals.

27. (Original) An apparatus according to claim 25, wherein said material

effective in accelerating deposition of carbon is provided in the form of a plurality of particles on said first electrode.

28. (Original) An apparatus according to claim 27, wherein said plurality of particles are provided on said first electrode at a density of  $10^{10}$  particles/cm<sup>2</sup> or higher.

29. (Previously Presented) An apparatus according to claim 21, wherein a thickness of said first electrode is larger than a thickness of said second electrode.

30. (Original) An apparatus according to any one of claims 21 to 29, wherein a plurality of said first electrodes and a plurality of said second electrodes are disposed on the surface of said substrate.

31. (Original) An apparatus according to claim 30, wherein said plurality of first electrodes and said plurality of second electrodes are electrically connected to wiring in matrix form.

32. (Previously Presented) An apparatus according to claim 30, wherein a phosphor capable of emitting light when irradiated with electrons emitted from said carbon fibers is provided on said third electrode.

33. (Original) An image display apparatus using an electron-emitting apparatus according to claim 32.

34. (Previously Presented) An electron-emitting device comprising:

A) a first electrode and a second electrode disposed on a surface of a substrate; and

B) a plurality of carbon fibers arranged on said first electrode and connected electrically to said first electrode,

wherein said second electrode is an electrode for controlling electron emission from said carbon fibers, and

wherein each of said carbon fibers comprises graphene.

35. (Previously Presented) An electron-emitting device according to claim 34, wherein the distance between an extreme end of said carbon fibers and the surface of said substrate is larger than the distance between the surface of said second electrode and the surface of said substrate.

36. (Original) An electron-emitting device according to claim 34, wherein said graphene comprises cylindrical graphene.

37. (Cancelled)



38. (Previously Presented) A light-emitting apparatus comprising an electron-emitting device according to any one of claims 34 to 36, and a light-emitting member.

39. (Previously Presented) An image display apparatus comprising a plurality of electron-emitting devices and a light emitting member capable of emitting light when irradiated with electrons emitted from some of said plurality of electron-emitting devices, wherein each of said plurality of electron-emitting devices is an electron-emitting device according to any one of claims 34 to 36.

40. (Previously Presented) A light-emitting apparatus according to claim 19, wherein said light-emitting member comprises a phosphor and an anode electrode, and is arranged on a second substrate arranged separately from said first substrate.

41. (Previously Presented) An image display apparatus according to claim 20, wherein said light-emitting member comprises a phosphor and an anode electrode, and is arranged on a second substrate arranged separately from said first substrate.

42. (Previously Presented) A light-emitting apparatus according to claim 38, wherein said light-emitting member comprises a phosphor and an anode electrode, and is arranged on an additional substrate arranged separately from said substrate.

43. (Previously Presented) An image display apparatus according to claim 39, wherein said light-emitting member comprises a phosphor and an anode electrode, and is arranged on an additional substrate arranged separately from said substrate.

44. (Currently Amended) An image display apparatus, comprising:

- A) an electron-emitting device arranged on a first substrate, and comprising a cathode electrode and a gate electrode; and
- B) a phosphor and an anode electrode arranged on a second substrate, wherein said electron-emitting device comprises a plurality of carbon fibers electrically connected to and disposed on said cathode electrode, and wherein each of said carbon fibers has a plurality of graphenes which are layered so as not to be parallel to an axis direction of each fiber.

45. (Currently Amended) A triode type electron-emitting apparatus, comprising:

- A) an electron-emitting device arranged on a first substrate, and comprising a cathode electrode and a gate electrode; and
- B) an anode electrode arranged on a second substrate, wherein said electron-emitting device comprises a plurality of carbon fibers electrically connected to and disposed on said cathode electrode, and wherein each of said carbon fibers has a plurality of graphenes layered so as not to be parallel to an axis direction of

each fiber.

46. (Previously Presented) An electron-emitting device comprising:  
a first electrode having a plurality of carbon fibers and a second electrode, said first and second electrodes being separated from each other but disposed on a same surface of an insulator,  
wherein an imaginary plane, which includes a top surface of said second electrode is substantially parallel to the surface of the insulator, and is arranged between the surface of the insulator and a second imaginary plane which includes a surface of the plurality of carbon fibers and which is substantially parallel to the surface of the insulator, and  
wherein said first electrode and said second electrode are electrically insulated from each other by the surface of the insulator.

47. (Previously Presented) An image display apparatus comprising:  
a first substrate having a plurality of electron-emitting devices; and  
a second substrate having an anode electrode and a light-emitting member disposed at a distance from said first substrate,  
wherein each of the plurality of electron-emitting devices is an electron-emitting device according to claim 46.

48. (Previously Presented) An electron-emitting device comprising:

a first electrode having a plurality of carbon fibers and a second electrode arranged at a distance from said first electrode on an insulator surface,  
wherein said first electrode and said second electrode are electrically insulated from each other by the insulator surface, and  
wherein a distance between the insulator surface and at least one portion of the plurality of carbon fibers is larger than a distance between a surface of said second electrode and the insulator surface.

49. (Previously Presented) An image display apparatus comprising:  
a first substrate having a plurality of electron-emitting devices; and  
a second substrate having an anode electrode and a light-emitting member, disposed at a distance from said first substrate,  
wherein each of the plurality of electron-emitting devices is an electron-emitting device according to claim 48.

50. (Previously Presented) An electron-emitting device comprising:  
a first electrode having a plurality of carbon fibers and a second electrode opposed to said first electrode,  
wherein said first and second electrodes are disposed on an insulating substrate surface at a distance from one another, and  
wherein said first and second electrodes are not insulated with an

insulating layer disposed between said first and second electrodes, and

wherein a distance between the insulating substrate surface and at least one portion of the plurality of carbon fibers is larger than a distance between a surface of said second electrode and the insulating substrate surface.

51. (Previously Presented) An image display apparatus comprising:  
a first substrate having a plurality of electron-emitting devices; and  
a second substrate having an anode electrode and a light-emitting member, disposed at a distance from said first substrate,  
wherein each of said electron-emitting devices is an electron-emitting device according to claim 50.

52. (Previously Presented) An electron-emitting device comprising:  
a first electrode having a plurality of carbon fibers and a second electrode which are disposed on a substrate surface so that said first and second electrodes are electrically insulated from each other,  
wherein an imaginary plane, which includes a top surface of said second electrode is substantially parallel to the substrate surface, is arranged between the substrate surface and another imaginary plane which includes at least some of the plurality of carbon fibers and which is substantially parallel to the substrate surface, and  
wherein said first and second electrodes are not insulated with an

insulating layer disposed on said second electrode.

53. (Previously Presented) An image display apparatus comprising:  
a first substrate having a plurality of electron-emitting devices, and  
a second substrate having an anode electrode and a light-emitting member, disposed at a distance from said first substrate,  
wherein each of said plurality of electron-emitting devices is an electron-emitting device according to claim 52.

54. (Previously Presented) An electron-emitting device comprising:  
a first electrode having a plurality of carbon fibers and a second electrode which are disposed on an insulating substrate surface so that said first and second electrodes are electrically insulated by the insulating substrate surface,  
wherein a distance between at least one electron emission site of the plurality of carbon fibers and the insulating substrate surface is larger than a distance between a surface of said second electrode and the insulating substrate surface, and  
wherein said first and second electrodes are not insulated with an insulating layer disposed on said second electrode.

55. (Previously Presented) An image display apparatus comprising:  
a first substrate having a plurality of electron-emitting devices, and

a second substrate having an anode electrode and a light-emitting member, disposed at a distance from said first substrate,

wherein each of said plurality of electron-emitting devices is an electron-emitting device according to claim 54.

56. (Previously Presented) An electron-emitting device comprising:

a first electrode having a plurality of carbon fibers and a second electrode which are disposed on a substrate surface so that said first and second electrodes are electrically insulated,

wherein a distance between at least one electron emission site of the plurality of carbon fibers is larger than a distance between a surface of said second electrode and said substrate surface, and

wherein said first and second electrodes are not insulated with an insulating layer disposed on said second electrode.

57. (Previously Presented) An image display apparatus comprising:

a first substrate having a plurality of electron-emitting devices, and  
a second substrate having an anode electrode and a light-emitting member, disposed at a distance from said first substrate,

wherein each of said plurality of electron-emitting devices is an electron-emitting device according to claim 56.

58. (Previously Presented) An electron-emitting device comprising:  
a first electrode having a plurality of carbon fibers and a second electrode which are disposed on a substrate surface so that said first and second electrodes are electrically insulated,

wherein an imaginary plane, which includes a top surface of said second electrode is substantially parallel to said substrate surface, is arranged between the substrate surface and another imaginary plane, which includes at least some of the plurality of carbon fibers and is substantially parallel to the substrate surface, and

wherein said first and second electrodes are not insulated with an insulating layer disposed on said second electrode.

59. (Previously Presented) An image display apparatus comprising:  
a first substrate having a plurality of electron-emitting devices, and  
a second substrate having an anode electrode and a light-emitting member, disposed at a distance from said first substrate,

wherein each of said plurality of electron-emitting devices is an electron-emitting device according to claim 58.

60. (Previously Presented) An electron-emitting device comprising:  
(A) a cathode electrode having a plurality of carbon fibers disposed on a first substrate; and



(B) a controlling electrode, for controlling an amount of emission current from at least one of the plurality of carbon fibers disposed on the first substrate, wherein each of the carbon fibers has a plurality of graphenes which are stacked so as not to be parallel to an axis direction of each of the carbon fibers.

61. (Currently Amended) An electron-emitting device comprising:

(A) a cathode electrode [[having]] on which a plurality of carbon fibers are disposed, on a first substrate; and

(B) a controlling electrode, for controlling an amount of emission current from at least one of the plurality of carbon fibers disposed on the cathode electrode on the first substrate, wherein each of the carbon fibers comprises a plurality of graphenes stacked in a direction not perpendicular to an axis direction of the carbon fiber.

62. (Currently Amended) An electron-emitting device comprising:

(A) a cathode electrode [[having]] on which a plurality of carbon fibers are disposed, on a first substrate; and

(B) a controlling electrode, for controlling an amount of emission current from at least one of the plurality of carbon fibers disposed on the cathode electrode on the first substrate, wherein each of the carbon fibers has a plurality of graphenes, and wherein the graphenes of each of the carbon fibers are stacked so that the graphenes of each of the carbon fibers are not disposed parallel to an axis direction of each of the carbon fibers.

63. (Currently Amended) An image display apparatus, comprising:

(A) an electron-emitting device arranged on a first substrate,

(B) a phosphor and an anode electrode arranged on a second substrate

opposing the first substrate, wherein said electron-emitting device comprises:

(i) a cathode electrode [[having]] on which a plurality of carbon fibers are disposed, on said first substrate; and

(ii) a controlling electrode, for controlling an amount of emission current from at least one of the plurality of carbon fibers disposed on the cathode electrode on the first substrate, wherein each of the carbon fibers has a plurality of graphenes which are stacked so as not to be parallel to an axis direction of each of the carbon fibers.

64. (Currently Amended) An image display apparatus, comprising:

(A) an electron-emitting device arranged on a first substrate,

(B) a phosphor and an anode electrode arranged on a second substrate

opposing said first substrate, wherein said electron-emitting device comprises:

(i) a cathode electrode [[having]] on which a plurality of carbon fibers are disposed, on the first substrate; and

(ii) a controlling electrode, for controlling an amount of emission current from at least one of the plurality of carbon fibers disposed on the cathode electrode on the first substrate, wherein each of the carbon fibers comprises a plurality of graphenes stacked in a direction not perpendicular to an axis direction of the carbon fiber.

65. (Currently Amended) An image display apparatus, comprising:
- (A) an electron-emitting device arranged on a first substrate,
  - (B) a phosphor and an anode electrode arranged on a second substrate
- opposing the first substrate, wherein said electron-emitting device comprises:
- (i) a cathode electrode ~~[[having]]~~ on which a plurality of carbon fibers are disposed, on the first substrate; and
  - (ii) a controlling electrode, for controlling an amount of emission current from at least one of the plurality of carbon fibers, disposed on the cathode electrode on the first substrate, wherein each of the carbon fibers has a plurality of graphenes, and wherein the graphenes of each of the carbon fibers are stacked so that the graphenes of each of the carbon fibers are not disposed parallel to an axis direction of each of the carbon fibers.
66. (Previously Presented) A television apparatus comprising
- an image display apparatus according to any one of claims 44, 63, 64
- and 65.
67. (Previously Presented) A computer apparatus comprising
- an image display apparatus according to any one of claims 44, 63, 64
- and 65.